

What is claimed is:

1. Diamond semiconductor having an exciton light-emission intensity characteristic that varies nonlinearly.

2. The diamond semiconductor according to claim 1, wherein the exciton light-emission is due to electron beam injection.

3. The diamond semiconductor according to claim 1, wherein the exciton light-emission has an optical wavelength of not more than 300nm.

4. The diamond semiconductor according to claim 1, wherein the exciton light-emission intensity increases rapidly in response to an electron beam above a threshold value.

5. The diamond semiconductor according to claim 1, wherein said diamond semiconductor is of high quality sufficient to emit ultraviolet light at room temperature in response to energy injection.

6. The diamond semiconductor according to claim 1, wherein said diamond semiconductor is an epitaxial diamond thin film obtained by diamond synthesis by means of a microwave plasma CVD method.

7. A diamond semiconductor light-emitting device comprising:

an *n*-type diamond semiconductor layer,

a *p*-type diamond semiconductor layer formed while maintaining a predetermined interval between it and said *n*-type diamond semiconductor layer, and

a high-quality undoped diamond semiconductor layer sandwiched between said *n*-type diamond semiconductor layer and said *p*-type diamond semiconductor layer,

wherein an exciton light emission that varies nonlinearly according to a current value is output from said undoped diamond semiconductor layer when current is injected to respective electrodes formed on said *n*-type and *p*-type diamond semiconductor layers.

8. A diamond semiconductor light-emitting device comprising:

a high-quality *n*-type diamond semiconductor layer,

a high-quality *p*-type diamond semiconductor layer formed in contact with said *n*-type diamond semiconductor layer, and

an activation region layer formed in an interface between said *n*-type diamond semiconductor layer and said *p*-type diamond semiconductor layer,

wherein an exciton light emission that varies nonlinearly according to a current value

is output from the activation region layer when current is injected to respective electrodes formed on said *n*-type and *p*-type diamond semiconductor layers.

9. The diamond semiconductor light-emitting device according to claim 7, wherein said *n*-type and *p*-type diamond semiconductor layers are each formed by doping with an impurity under a gas phase during gas phase synthesis using a CVD method.

10. The diamond semiconductor light-emitting device according to claim 8, wherein said *n*-type and *p*-type diamond semiconductor layers are each formed with a high-quality undoped diamond semiconductor layer and by ion injection of an impurity in said undoped diamond semiconductor layer.